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A DATABASE FOR REVIEWING AND SELECTING RADIOACTIVE WASTE TREATMENT TECHNOLOGIES AND VENDORS

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Abstract

Several attempts have been made in past years to collate and present waste management technologies and solutions to waste generators. These efforts have been manifested as reports, buyers' guides, and databases. While this information is helpful at the time it is assembled, their principal weakness is maintaining the timeliness and accuracy of the information over time. In many cases, updates have to be published or developed as soon as the product is disseminated. The recently developed *National Low-Level Waste Management Program's Technologies Database* is a vendor-updated Internet based database designed to overcome this problem.

The *National Low-Level Waste Management Program's Technologies Database* contains information about waste types, treatment technologies, and vendor information. Information is presented about waste types, typical treatments, and the vendors who provide those treatment methods. The vendors who provide services update their own contact information, their treatment processes, and the types of wastes for which their treatment process is applicable. This information is queriable by a generator of low-level or mixed low-level radioactive waste who is seeking information on waste treatment methods and the vendors who provide them. Timeliness of the information in the database is assured using time clocks and automated messaging to remind featured vendors to keep their information current. Failure to keep the entries current results in a vendor being warned and then ultimately dropped from the database. This assures that the user is dealing with the most current information available and the vendors who are active in reaching and serving their market.

Introduction

The National Low-Level Waste Management Program (NLLWMP) at the Idaho National Engineering and Environmental Laboratory (INEEL) assists the U.S. Department of Energy (DOE), and specifically the DOE's Center of Excellence For Low-Level and Mixed Low-Level Waste, in fulfilling its responsibilities under the Low-Level Radioactive Waste Policy Amendments Act of 1985. The NLLWMP assists the DOE by providing technical assistance to states and compact regions as they develop new commercial low-level radioactive waste (LLW) management systems.

The objective of the NLLWMP is to provide technical expertise, information, and other resources to states and compact regions in support of the development of their LLW or mixed low-level waste (MLLW) management programs and facilities. Principal areas of activity include providing workshops, fulfilling state-specific requests, developing technical documents, distributing general information on LLW and MLLW and providing information management, providing technical coordination of organizations and LLW management projects, and supplying other assistance as requested.

As part of the NLLWMP's function of developing and distributing technical information, a *National Low-Level Waste Management Program Technologies Database* has been developed that is publicly accessible on the Internet from the INEEL homepage. This database brings together two targeted groups: vendors of LLW and MLLW technologies and services, and LLW and MLLW generators. The Department of Energy has funded this database in the hopes that generators will be able to quickly and easily identify appropriate solutions for their particular waste treatment and disposal problems without waiting for government intervention.

This database contains information about waste types, regulations, treatment technologies, and vendors that provide services and/or technologies for LLW or MLLW. These vendors update their own information such as point of contact, services provided, treatment processes, and the types of wastes for which their services or treatment processes are applicable. This information is queriable by a generator of low-level or mixed low-level radioactive waste who is seeking information on waste management services or waste treatment methods and the vendors who provide them. Timeliness of the information in the database is assured using time clocks and automated messaging to remind vendors to keep their information current. Failure to keep the entries current results in a vendor being warned and then ultimately dropped from the database. This assures that the user is dealing with the most current information available and the vendors who are active in reaching and serving their market.

Database Content

The NLLWMP homepage is located at http://www.inel.gov/national-frame.html which contains a hot link to the home page for the "*National Low-Level Waste Management*

Program's Technologies Database." From this "Technology Gateway©" homepage, one can link to several pages to access search functions or information. These links include:

- Search LLW Vendors
- Search MLLW Vendors
- Vendor Selection Guide
- NLLWMP Web Links
- Treatment Dictionaries

This page also allows vendors to request inclusion in the site to list their technology or service, and allows vendors already registered to access a Vendor Login screen to manage their account using a vendor specific identification number and password.

Vendor Selection Guide

The first screen a user should access is the vendor selection guide. This provides the information regarding limitations of the database, a legal disclaimer, computer security disclaimer, and a definition of unauthorized use.

Validity of the information in the database is limited by the accuracy of the data provided by the vendor. While the information contained in the database is believed to be generally true, none of the information has been evaluated against any criteria, nor has it been validated by DOE or INEEL. Once a vendor has applied for the inclusion of their service or technology into the NLLWMP Technology Database, the vendor assumes all responsibility for the accuracy of the information that they have submitted. Therefore LLW and MLLW generators using this database as a resource should carefully consider the appropriateness of the listed technology for their purposes, and ascertain the viability of the listed vendor to complete work for which the generator may contract.

Search LLW and MLLW Vendors

There are two links to search pages, one to LLW vendors and one to MLLW vendors. Searches can be performed on Company Name, Phone Number, Zip Code, Waste Category and/or Waste Description. For convenience in identifying the waste categories and waste descriptions contained in the database, drop-down lists are provided. The exact company name, telephone number or zip code are not required, the database will search for and return fields that are similar. If the exact name is not used, a list of vendors with similar names will appear as shown in Table 1 where the vendor name is hot linked to the vendor information page shown in Tables 2 and 3 for LLW vendors. The drop down list of waste categories and descriptions associated with LLW are shown in Table 3. If the vendor also provides MLLW services or technologies, a third information page will appear as shown in Table 4, where the waste categories and descriptions associated with

MLLW are shown in Table 5. The information provided by the vendors is in the last column of Tables 2, 3 and 4.

Table One

Example Of Database Query For LLW Vendors*

Company	Address	Phone
A&L Underground Inc	201 E. Loula PO Box 878 Olathe, KS 66061	913-829-0167
A-Z Waste Tek Ltd	32A Pooch Rd Upton Poole Dorset England BH16 5JB	01144 1202 624985
ABB Air Preheater	650 Warnenville Road Lisle, IL 60532	630-971-2500 ext. 209
ABB Combustion Engineering	Nuclear Operations 2000 Day Hill Rd Windsor, CT 06095	860-285-5835
Accurra Products & Services	PO Box 4433 Bremerton, WA 98312	360-377-8213

* This is a partial return for a query for company names with the letter "a" in the name.

Table Two

General Company Information for a Specific Company Query.

COMPANY GENERAL INFORMATION	
Company Name:	
Company Home Page:	Internet URL
Company Description:	Short description of the company.
SBIR Level:	
Wastes Handled:	Low Level Waste Mixed Low Level Waste
POC Name:	Company point of contact
POC Title:	
Address:	
City, State Zip:	
Phone:	
Fax:	
E-mail:	

Table Three

Low Level Waste Information for a Specific Company Query.

Low Level Waste Section	
LLW POC:	Point of contact for LLW
POC Title:	
POC Address:	
POC City, State, Zip:	
POC Phone:	
POC Email:	
POC Fax:	
LLW Process Description:	
LLW Certification(s):	
LLW Waste Categories:	Byproduct Material Special Nuclear Material Accelerator Produced Material Source Material Naturally Occurring Material II(e)(2) Material Low Activity Radioactive Material
LLW Waste Description:	Incinerator ash Gas Aqueous liquid Filter media Mechanical filter EPA or state hazardous Demolition rubble Cation ion-exchange media Anion ion exchange media Contaminated equipment Organic glassware or lab ware Sealed source/device Paint or plating Evaporator bottoms/sludges/concentrates Compactible trash Noncompactible trash Animal Carcass Biological material (non-animal carcass) Activated material Other, describe

Table Four

Mixed Low Level Waste Information for a Specific Company Query.

Mixed Low Level Waste Section		
MLLW POC:	Point of contact for MLLW	
POC Title:		
POC Address:		
POC City, State, Zip:		
POC Phone:		
POC Email:		
POC Fax:		
Permits	Yes/No	Description
Treat, Store or Dispose MLLW		License number, authorizing party (EPA, NRC or state), duration of license, and scope or limitations of the license.
Perform Treatability Studies on MLLW		License number, authorizing party EPA, NRC or state), duration of license, and scope or limitations of the license.
Services	Yes/No	Description
Storage		Summary of capabilities and limitations with respect to the waste types and quantities of waste acceptable for storage.
Disposal		Summary of capabilities and limitations with respect to the waste types and quantities of waste acceptable for storage.
Transport		Summary of capabilities and limitations with respect to the waste types and quantities of waste acceptable for storage.
Treatment and/or Stabilization		Method(s), capabilities and limitations of the process. Performed in your facility, at the customer facility or at either location?
Decontamination		Method(s), capabilities and limitations of the process. Performed in your facility, at the customer facility or at either location?
Treatability Studies		Treatment technology employed.
Waste Characterization		Capabilities and limitations with respect to the types of contaminants that can be detected and quantified.
Technologies	Yes/No	Description
Stabilization Equipment or Technology		Technology, equipment or product produced for use or resale.
Decontamination Equipment or Technology		Technology, equipment or product produced for use or resale.
Permitted and Deployed		If the technology has been permitted and deployed for the treatment of MLLW, summary of the circumstances of deployment and use.
MLLW Waste Categories:		
MLLW Waste Description:		

Table Five

Waste Matrices and Contaminants

Aqueous Liquids and Slurries

- Wastewaters and Aqueous Slurries
- Acidic Wastewaters and Aqueous Slurries
- Basic Wastewaters and Aqueous Slurries
- Cyanide Wastewaters

Soils

- Organic Contaminated Soils (halogenated or nonhalogenated)
- RCRA Metal Contaminated Soils
- Contaminated Soils/Debris

Organic Liquids

- Aqueous/Organic Liquids
- Aqueous/Halogenated or Nonhalogenated Organic Liquids
- Pure Halogenated or Nonhalogenated Organic Liquids
- PCBs

Debris Waste

- Metal Debris
- Concrete
- Glass
- Ceramic/Brick
- Asbestos
- Combustible (Plastic/Rubber, Wood, Paper/Cloth/Trash)
- Graphite
- Biological
- Composite Filters
- Asphalt

Solid Process Residues

- Inorganic Particulates
- Ash
- Sand Blasting Media
- Absorbed Aqueous or Organic Liquids
- Ion Exchange Media
- Calcined Solids
- Inorganic Sludges
- Wastewater Treatment Sludges
- Plating Waste Sludges
- Paint Waste-Liquids/Sludges, Chips/Solids
- RCRA Metal Salt Wastes
- Organic Process Residues
- Activated Carbon (halogenated or nonhalogenated)
- Organic Resins (halogenated or nonhalogenated)
- Organic Absorbents (halogenated or nonhalogenated)
- Organic Sludges (halogenated or nonhalogenated)
- Organic Particulates (halogenated or nonhalogenated)
- Biological Materials
- Organic Chemicals (halogenated or nonhalogenated)

Special Waste

- Reactive Metals
- Components Contaminated with Reactive Metals
- Pyrophoric Fines
- Explosives/Propellants
- Compressed Gases/Aerosols

Inherently Hazardous Waste

- Elemental Mercury
- Elemental Lead
- Beryllium
- Batteries
- Lead Acid Batteries
- Cadmium Batteries

Treatment Dictionaries

In addition to the vendor search capability, the site contains two treatment dictionaries: one for LLW and another for MLLW. These dictionaries describe the sources and characteristics of these wastes, the associated regulatory issues, and the technologies and processes applicable to the treatment of these wastes.

The LLW dictionary describes the type of commercial low-level radioactive waste streams emanating from nuclear power plants and from institutional and industrial facilities. It then describes potential commercial waste-treatment processes for these commercially generated waste streams. The commercially available technologies described on this Web site are listed in Table 6.

Each category contains several technologies with a brief description of each including the types of input streams for which the technology is applicable, the output streams and secondary wastes generated, the advantages and disadvantages of using the technology, the status of the technology with respect to commercialization and availability, and commercial vendors available that provide a service with that technology.

There are many companies that provide treatment for commercially generated low-level radioactive waste and mixed waste. These vendor's capabilities range from simple volume reduction technologies such as sizing and cutting to more sophisticated techniques such as incineration and vitrification. Some vendors provide brokerage services, which may be attractive to smaller waste generators who may not have time to evaluate a wide spectrum of treatment options.

The MLLW dictionary is similar to the LLW dictionary in that MLLW and its sources are defined, and the issues associated with dual regulation under the Nuclear Regulatory Commission (NRC) and the Environmental Protection Agency (EPA) are discussed. In addition to the Atomic Energy Act, which authorizes regulation of nuclear material by the NRC, the Resource Conservation and Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA) authorize regulation of hazardous materials by the EPA. A major portion of this dictionary is devoted to the discussion of MLLW regulations and the regulatory requirements.

Methods for treating the various categories of MLLW shown in Table 5 are suggested along with a discussion of various technologies and processes. This technology description follows the structure of the LLW dictionary including a brief description of the technology, descriptions of input and output streams, advantages and disadvantages of using the particular technology, technology status, and commercial vendors available that provide a service with that technology or are developers of that technology. Many of the LLW technologies are also applicable to MLLW and are referenced in the MLLW dictionary. However, the MLLW dictionary includes additional technologies that could be used for treatment or disposal of LLW, as well as technologies that are currently under development and may not be proven and available for several years. Thus, it is incumbent

on the generator to contact the vendor or developer to determine the status and applicability of the technology of interest. The MLLW technologies described on this Web site are listed in Table 7.

Table Six

LLW Technologies Described in the NLLWMP Database

Sizing • Arc Saw Cutting • Plasma Arc Cutting • Oxygen Burning • Hacksaws and Guillotine Saws • Shredding • Cryogenic Fracturing • Abrasive Cutter • Thermite Reaction Lance • Laser Cutting • Water Jet Cutting • Abrasive Jet Cutting • Cryogenic Cutting • Shears • Pipe/Wire Cutters	**Physical/Chemical Treatment** • Neutralization • Oxidation/Reduction • Soil Washing • Steam Reforming • Alkaline Hydrolysis for Biological Materials • Supercritical Water Oxidation • Quantum-Catalytic Extraction Process • Thermal Desorption **Metal Recovery**
Volume Reduction • Compaction • Baling	**Incineration** • Controlled Air • Industrial Boiler
Filtration • Cartridge Filters • Bag-Type Filters • Reusable Filters Without Precoat • Reusable Filters With Precoat • Electrodialysis • Ultrafiltration • Granular Bed Filtration	**Separation** • Reverse Osmosis • Ion-Exchange • Carbon Adsorption • Precipitation • Centrifugation • Drying (Thermal) • Dewatering (Filtration) • Distillation • Steam Stripping
Decontamination • Mechanical Decontamination • Chemical Decontamination	**Vitrification** • Glass Furnace • Microwave Melter
Evaporation • Pot and Kettle Evaporators • Natural Circulation Evaporators • Forced Circulation Evaporators	**Immobilization/Stabilization** • Portland Cement Systems • Encapsulation • Absorption

Table Seven

MLLW Technologies Described in the NLLWMP Database

Thermal Destruction • Plasma Torch • DC Electric Arc Furnace • Molten Salt Oxidation • Rotary Kiln Incinerator • Gas Phase Reduction • Catalytic Chemical Oxidation (CCO)	**Wastewater Treatment** • Magnetic Separation • Regenerable Mercury Sorbent • Microfiltration • Ultraviolet (UV) Photo-Oxidation • Wet Oxidation
Nonthermal Treatment • Acid Digestion • Direct Chemical Oxidation (DCO) • Mediated Electrochemical Oxidation • Delphi DETOX$^{(SM)}$ Process • Base Hydrolysis	**Separation Processes** • Thermal Desorption • Vacuum Thermal Desorption • Mercury Leaching • Supercritical Carbon Dioxide Extraction • Self-Assembled Mesoporous Mercaptan Support (SAMMS) • Sonic Agitation with Peroxide
Nonthermal Stabilization • Chemically Bonded Phosphate Ceramic (CBPC) • Polymer Microencapsulation by Extrusion (PME) • Polymer Microencapsulation by Kinetic Mixing (PMK) • Sulfur Polymer Cement • MAECTITE • Enhanced Cement for High Salt Content Mixed Wastes • Sol-gel to Stabilize High Salt Content Mixed Wastes • Polysiloxane Based Material Binder for High Salt Content Mixed Wastes • Sintering for Stabilizing Fly Ash • Mercury Stabilization (De-Merc Process) • Liquid Elemental Mercury Amalgamation Treatment System	

Summary

The database developed by the NLLWMP provides a vehicle for disseminating up-to-date information regarding regulatory issues and commercial capabilities for characterizing, treating and disposing of low-level and mixed low-level radioactive waste. This database, maintained at the INEEL and updated by vendors with waste management capabilities, provides waste generators with information that will assist them in developing waste management options for the disposition of current and future wastes.

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